

REMARKS/ARGUMENTS

Applicants responds herein to the Office Action dated April 19, 2004.

Preliminarily, the Applicants note the indication that claims 2, 4, 6, 7, 10 and 11 are directed to patentable subject matter.

Accordingly, inasmuch as claim 1 has been amended to include the limitation of allowable claim 2, and claim 3 the allowable limitations of claim 4 and claim 8 the allowable limitations of claim 10, these claims and their dependent claims should be promptly allowed.

As to claims 5, 12, 17 and 19, these claims have been amended or newly presented to define the light source as comprising flash lamps. As defined in the instant specification the term “flash lamps” as used therein is unique in that it is capable of producing extremely intense irradiation energy, that is capable of heating the substrate virtually instantaneously, e.g., in a time period from .1 millisecond to 10 millisecond, to attain a temperature on the order of 1000°C. See page 13, line 9 to page 14, line 3 of the specification.

The unique characteristic of such a thermal processing that utilizes flash lamps is that the surface of the substrate is very abruptly heated and expanded which tends to warp the substrate into a convex shape. When this happens, the substrate may crack due to stress received from the susceptor (page 14, lines 18-23 of the specification).

Another characteristic feature of the aforementioned claims is that the thermal processing susceptor has “a flat receiving surface having a region larger than the planar size of said substrate...”.

Lastly, a tapered surface angularly encloses the peripheral edge of the receiving surface “for specifying said receiving surface”.

The tapered surface serves dual purposes. First, when a substrate is introduced into the holding element which is intended to hold the substrate in a substantially horizontal holding position in the chamber, the tapered surface is steep enough to help place and center the substrate flat on the flat receiving surface. This provides the benefit that the substrate is better located relative to the various lamps and heating implements and also that it is better supported on the flat receiving surface during its preheating process and is least likely to be adversely affected thereby.

Secondly, when the flash light source is actuated and the substrate experiences a sudden, and extremely rapid expansion, its peripheral edge is able to ride up the tapered surface with minimal surface-to-surface contact, which eliminates or greatly reduces any problem of warping or cracking.

Turning to the references, it is respectively submitted that none of them discloses the invention specified in the independent claims of the instant application. Moto, which the Office Actions utilizes and asserts to anticipate claims 1, 3, 5, 8-9 and 12 deploys halogen lamps to heat the substrate. Such lamps do not have the characteristics of being able to so rapidly heat the substrate as to cause the cracking problem described in the instant specification. Indeed, such terms as “crack”, or “break” or “expand” appear nowhere in this reference. The primary objective of this reference is to assure even heating of the substrate including its peripheral, circumstantial edge surfaces.

Although this reference provides, as described at column 6, lines 30-35, a substrate bearing part 13 with an inclined surface 13a, that surface has no function in centering and placing the substrate so that it lies flat and in contact with the flat receiving surface. As seen in all of the figures of the Moto reference, the substrate lies on the inclined surface 13a, which is indicated at column 6 of this reference to have an angle of inclination which is roughly 5 degrees. Accordingly, the instant claims differ from Moto in that Moto does not utilize a flash light as defined herein, does not provide the claimed flat receiving surface that has size larger than the planar size of the substrate, and does not provide an inclined surface capable of properly centering and locating the substrate to its initial, preheating position.

The Arai et al. reference discloses a heating apparatus using flash lamps. However, this reference does not recognize or solve the problem of cracking caused by instant thermal expansion of the substrate surface when flash lamps are used. Arai et al. does not complement or supplement the missing teaching in the primary Moto reference in that it does not teach a structure where a tapered surface is provided to surround the periphery of the receiving surface of the susceptor.

Turning to the rejection of claims 14-16 on the grounds of obviousness over Moto in view of Lee et al., it is noted that the latter reference discloses an apparatus for heating with heating plate 10, not by a thermal processing apparatus that utilizes flashlight irradiation. This

reference describes at column 6 (and elsewhere) heating in a temperature range which is on the order of about 300°C which is nowhere near the 1000° - 1100°C to which a flash light heats the substrate of the present invention. Therefore the problem for the present invention is not encountered here. In Lee, column 8, lines 30-37 describe an arrangement to prevent rapid heating and corresponding temperature changes in the substrate. Lee further does not appear to have the claimed flat receiving surface of the present invention. Rather, the substrate is supported on circumstantially extending ledges.

It is also worth noting that the ledge surrounding the substrate is quite steep and its function is exclusively to precisely place the wafer during the wafer being transported as described at column 4, line 66 to column 5, line 8 of this reference.

Based on the foregoing remarks, it is respectfully submitted that the references of record do not anticipate and do not render obvious any of the inventions that are set forth in the various independent claims of the present application and necessarily therefore, any of the claims which are dependent thereon.

Accordingly, the Examiner is respectfully requested to reconsider the application, allow the claims as amended and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 9, 2004

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July 9, 2004

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